

We claim:

1. A method for identifying herbicidally active substances, wherein:
 - 5 a) the expression or the activity of the gene product of a nucleic acid or a gene encompassing:
 - 10 aa) a nucleic acid sequence with the sequence shown in SEQ ID NO: 1, SEQ ID NO: 3, SEQ ID NO: 5, SEQ ID NO: 7, SEQ ID NO: 9, SEQ ID NO: 11, SEQ ID NO: 13, SEQ ID NO: 15, SEQ ID NO: 17, SEQ ID NO: 19, oder SEQ ID NO: 21, SEQ ID NO: 23, SEQ ID NO: 25, SEQ ID NO: 27, SEQ ID NO: 29, SEQ ID NO: 31, SEQ ID NO: 33, SEQ ID NO: 35, SEQ ID NO: 37, SEQ ID NO: 39, SEQ ID NO: 41, SEQ ID NO: 43, SEQ ID NO: 45, SEQ ID NO: 47, SEQ ID NO: 49 or
15 SEQ ID NO: 51;
 - bb) a nucleic acid sequence which can be derived from the amino acid sequences shown in SEQ ID NO: 2, SEQ ID NO: 4, SEQ ID NO: 6, SEQ ID NO: 8, SEQ ID NO: 10, SEQ ID NO: 12, SEQ ID NO: 14, SEQ ID NO: 16, SEQ ID NO: 18, SEQ ID NO: 20, oder SEQ ID NO: 22, SEQ ID NO: 24, SEQ ID NO: 26, SEQ ID NO: 28, SEQ ID NO: 30, SEQ ID NO: 32, SEQ ID NO: 34, SEQ ID NO: 36, SEQ ID NO: 38, SEQ ID NO: 40, SEQ ID NO: 42, SEQ ID NO: 44, SEQ ID NO: 46, SEQ ID NO: 48, SEQ ID NO: 50 or SEQ ID NO: 52
20 by backtranslation owing to the degeneracy of the genetic code;
 - cc) a nucleic acid sequence which is a derivative or a fragment of the nucleic acid sequences shown in SEQ ID NO: 1, SEQ ID NO: 3, SEQ ID NO: 5, SEQ ID NO: 7, SEQ ID NO: 9, SEQ ID NO: 11, SEQ ID NO: 13, SEQ ID NO: 15, SEQ ID NO: 17, SEQ ID NO: 19, oder SEQ ID NO: 21, SEQ ID NO: 23, SEQ ID NO: 25, SEQ ID NO: 27, SEQ ID NO: 29, SEQ ID NO: 31, SEQ ID NO: 33, SEQ ID NO: 35, SEQ ID NO: 37, SEQ ID NO: 39, SEQ ID NO: 41, SEQ ID NO: 43, SEQ ID NO: 45, SEQ ID NO: 47, SEQ ID NO: 49 or SEQ ID NO: 51
30 and which has at least 60% homology at the nucleic acid level;
 - dd) a nucleic acid sequence which encodes derivatives or fragments of the polypeptides with the amino acid sequences shown in SEQ ID NO: 2, SEQ ID NO: 4, SEQ ID NO: 6, SEQ ID NO: 8, SEQ ID NO: 10, SEQ ID NO: 12, SEQ ID NO: 14, SEQ ID NO: 16, SEQ ID NO: 18,
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- 5 SEQ ID NO: 20, oder SEQ ID NO: 22, SEQ ID NO: 24, SEQ ID NO: 26, SEQ ID NO: 28, SEQ ID NO: 30, SEQ ID NO: 32, SEQ ID NO: 34, SEQ ID NO: 36, SEQ ID NO: 38, SEQ ID NO: 40, SEQ ID NO: 42, SEQ ID NO: 44, SEQ ID NO: 46, SEQ ID NO: 48, SEQ ID NO: 50 or SEQ ID NO: 52 and which have at least 50% homology at the amino acid level;
- 10 ee) a nucleic acid sequence which encodes a fragment or an epitope of a polypeptide which binds specifically to an antibody, the antibody specifically binding to a polypeptide which is encoded by the sequence shown in SEQ ID NO: 1, SEQ ID NO: 3, SEQ ID NO: 5, SEQ ID NO: 7, SEQ ID NO: 9, SEQ ID NO: 11, SEQ ID NO: 13, SEQ ID NO: 15, SEQ ID NO: 17, SEQ ID NO: 19, oder SEQ ID NO: 21, SEQ ID NO: 23, SEQ ID NO: 25, SEQ ID NO: 27, SEQ ID NO: 29, SEQ ID NO: 31, SEQ ID NO: 33, SEQ ID NO: 35, SEQ ID NO: 37, SEQ ID NO: 39, SEQ ID NO: 41, SEQ ID NO: 43, SEQ ID NO: 45, SEQ ID NO: 47, SEQ ID NO: 49 or SEQ ID NO: 51;
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- 20 ff) a nucleic acid sequence which encodes a fragment of a nucleic acid shown in aa) and which has a translation releasing factor activity, a cobalamin synthase activity, an arginyl-tRNA synthase activity, an RNA helicase activity, a GTP binding protein activity, a pseudouridylate synthase activity, an adenylate kinase activity, a preprotein translocase secA precursor protein activity, a DCL protein activity, an arginine-tRNA ligase activity, a plastidial glutathione reductase activity, a transcription factor sigma activity, a calmodulin activity, an INT6 activity, a helicase YGL150c activity, an RNA-binding activity, a heat shock transcription factor activity, a chloroplastidial DNA nucleoid binding activity or a Met2-type cytosin DNA methyltransferase activity; and/or
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- 35 gg) a nucleic acid sequence which encodes derivatives of the polypeptides with the amino acid sequences shown in SEQ ID NO: 2, SEQ ID NO: 4, SEQ ID NO: 6, SEQ ID NO: 8, SEQ ID NO: 10, SEQ ID NO: 12, SEQ ID NO: 14, SEQ ID NO: 16, SEQ ID NO: 18, SEQ ID NO: 20, oder SEQ ID NO: 22, SEQ ID NO: 24, SEQ ID NO: 26, SEQ ID NO: 28, SEQ ID NO: 30, SEQ ID NO: 32, SEQ ID NO: 34, SEQ ID NO: 36, SEQ ID NO: 38, SEQ ID NO: 40, SEQ ID NO: 42, SEQ ID NO: 44, SEQ ID NO: 46, SEQ ID NO: 48, SEQ ID NO: 50 or

SEQ ID NO: 52 and which has at least 20% homology at the amino acid level and has an equivalent biological activity;

or

- 5 b) the expression or activity of an amino acid sequence which is encoded by a nucleic acid sequence of aa) to gg),

is influenced and such substances which reduce or block the expression or the activity are selected.

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2. A method as claimed in claim 1, wherein the expression or the activity of the nucleic acid or the protein is reduced or blocked by reducing or blocking the

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- a) transcription,
- b) translation,
- c) processing and/or
- d) modification

of the nucleic acid sequence or amino acid sequence in claim 1.

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3. A method as claimed in claim 1 or 2, wherein the activity of the nucleic acid or of the protein is reduced or blocked by a low-molecular-weight substance.

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4. A method as claimed in any of claims 1 to 3, wherein the identification of the substances is carried out in a high-throughput screening (HTS).

5. A method as claimed in one of claims 1 to 4, wherein the selected substances are applied to a plant in order to test the herbicidal activity of the substances and the substances which show herbicidal activity are selected.

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6. A method as claimed in one of claims 1 to 5, wherein the method is carried out in an organism.

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7. A method as claimed in one of claims 1 to 6, wherein bacteria, yeasts, fungi or plants are used as the organism.

8. A method as claimed in one of claims 1 to 7, wherein an organism is used which is a conditional or natural mutant of one of the sequences described in claim 1.

9. A nucleic acid construct comprising a nucleic acid sequence as shown in claim 1, wherein the nucleic acid sequence is linked to one or more regulatory signals.
- 5 10. A substance identified by a method as claimed in one of claims 1 to 8, the substance having a molecular weight of less than 1000 daltons and more than 50 daltons and a K_i value of less than 10^{-7} M.
- 10 11. A substance identified by a method as claimed in one of claims 1 to 8, the substance being a proteinogenic substance or an antisense RNA.
12. A substance as claimed in claim 11, the substance being an antibody against the protein encoded by one of the sequences shown in claim 9.
- 15 13. A nucleic acid construct as claimed in claim 9, the nucleic acid construct additionally comprising further nucleic acid sequences.
14. A vector comprising a nucleic acid construct as claimed in claim 9 or 13.
- 20 15. An organism comprising at least one nucleic acid construct as claimed in claim 9 or 13 or at least one vector as claimed in claim 14.
16. An organism as claimed in claim 15, the organism being a plant, a microorganism or a nonhuman animal.
- 25 17. A transgenic plant comprising a functional or nonfunctional nucleic acid construct as claimed in claim 9 or 13 or a vector as claimed in claim 14.
18. The use of a nucleic acid construct as claimed in claim 9 or 13 or of a vector as claimed in claim 14 for the generation of transgenic plants.
- 30 19. A method of identifying an antagonist of proteins which are encoded by a nucleic acid sequence as claimed in claim 9 or 13 by following through the following method steps
 - 35 i) contacting cells which express the protein, or the protein, with a candidate substance;
 - ii) testing the biological activity of the protein;

- iii) comparing the biological activity of the protein with a standard activity in the absence of the candidate substance, a reduced biological activity of the protein indicating that the candidate substance is an antagonist.

- 5 20. A method as claimed in claim 19, wherein the antagonist identified in accordance with claim 19, letter iii), is applied to a plant to test its herbicidal activity, and those antagonists which show a herbicidal activity are selected.
- 10 21. A method of controlling undesired vegetation, which comprises allowing a herbicidally active amount of a substance identified by a method as claimed in any of claims 1 to 8 or of an antagonist identified by a method as claimed in claim 19 or 20 to act on plants and/or their environment.
- 15 22. The use of a substance identified by a method as claimed in any of claims 1 to 8 or of an antagonist identified by a method as claimed in claim 19 or 20 as herbicide or for regulating the growth of plants.
- 20 23. A method for generating modified gene-products encoded by the nucleic acid sequences SEQ ID NO: 1, SEQ ID NO: 3, SEQ ID NO: 5, SEQ ID NO: 7, SEQ ID NO: 9, SEQ ID NO: 11, SEQ ID NO: 13, SEQ ID NO: 15, SEQ ID NO: 17, SEQ ID NO: 19, oder SEQ ID NO: 21, SEQ ID NO: 23, SEQ ID NO: 25, SEQ ID NO: 27, SEQ ID NO: 29, SEQ ID NO: 31, SEQ ID NO: 33, SEQ ID NO: 35, SEQ ID NO: 37, SEQ ID NO: 39, SEQ ID NO: 41, SEQ ID NO: 43, SEQ ID NO: 45, SEQ ID NO: 47, SEQ ID NO: 49 or SEQ ID NO: 51, their derivates or fragments as claimed in claim 1, which comprises the following method steps:
- 25 a) expression of the proteins encoded by SEQ ID NO: 1, SEQ ID NO: 3, SEQ ID NO: 5, SEQ ID NO: 7, SEQ ID NO: 9, SEQ ID NO: 11, SEQ ID NO: 13, SEQ ID NO: 15, SEQ ID NO: 17, SEQ ID NO: 19, oder SEQ ID NO: 21, SEQ ID NO: 23, SEQ ID NO: 25, SEQ ID NO: 27, SEQ ID NO: 29, SEQ ID NO: 31, SEQ ID NO: 33, SEQ ID NO: 35, SEQ ID NO: 37, SEQ ID NO: 39, SEQ ID NO: 41, SEQ ID NO: 43, SEQ ID NO: 45, SEQ ID NO: 47, SEQ ID NO: 49 or SEQ ID NO: 51, their derivatives or fragments as claimed in claim 1 in a heterologous system or in a cell-free system
- 30 b) randomized or directed mutagenesis of the protein by modification of the nucleic acid,
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- c) measuring the interaction of the modified gene product with the herbicide or the biological activity of the modified gene product in the presence of the herbicide,
 - 5 d) identification of derivatives of the protein which exhibit a lesser degree of interaction or whose activity is less affected,
 - e) testing the biological activity of the protein following application of the herbicide,
 - 10 f) selection of the nucleic acid sequences which, or whose gene products, show a modified biological activity with regard to the herbicide.
24. A method as claimed in claim 23, wherein the sequences selected in accordance with claim 23 f) are introduced into an organism.
- 15 25. A method for generating transgenic plants which are resistant to substances found by a method as claimed in any of claims 1 to 8 or a method as claimed in claim 19 or 20, which comprises overexpressing, in these plants, nucleic acids with the sequences as described in claim 1.
- 20 26. An organism generated by a method as claimed in claim 23 or 24 or a method as claimed in claim 25.
- 25 27. A composition comprising a herbicidally active amount of at least one substance identified by a method as claimed in any of claims 1 to 8 or of an antagonist identified by a method as claimed in claim 19 or 20 and at least one inert liquid and/or solid carrier and, if appropriate, at least one surface-active substance.
- 30 28. A composition comprising a growth-regulating amount of at least one substance identified by a method as claimed in any of claims 1 to 8 or of an antagonist identified by a method as claimed in claim 19 or 20 and at least one inert liquid and/or solid carrier and, if appropriate, at least one surface-active substance.
- 35 29. A composition comprising the substance as claimed in any of claims 10 to 12 or an antagonist as claimed in claim 19.
- 40 30. A kit encompassing the nucleic acid construct as claimed in claim 9 or 13, the substance as claimed in any of claims 10 to 12, an antagonist identified as claimed in claim 19 or 20, and the composition as claimed in claim 29.